(12) UK Patent Application (19) GB (11) 2 034 839 A

(21) Application No 7833318
(22) Date of filing 15 Aug 1978
(43) Application published
11 Jun 1980
(51) INT CL³
F16L 39/00
(52) Domestic classification
F2G 13 2B
(56) Documents cited
GB 1097049
GB 959612
GB 792599
GB 790262
GB 780504
GB 744363
(58) Field of search
F2G
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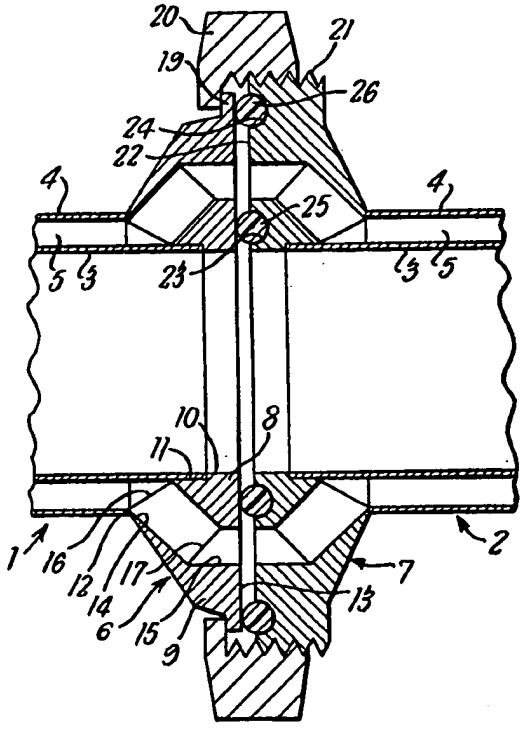
(54) A coupling element and pipe coupling for use with jacketed pipes

(57) The invention concerns a coupling element and pipe coupling for use with jacketed pipes, i.e. pipes having an inner main flow passage and an outer coaxial auxiliary flow passage. The coupling element comprises a radially inner part 8 having a first annular section 11 for securing to the inner pipe 3 of the jacketed pipe and defining an inner bore for alignment with the main flow passage. A radially outer part 9 of the element has a second annular section 12 for securing to the outer pipe and a passage extends between the inner and outer parts and opens at one end between the first and second annular sections and at the other end into an axial face 13 of the element. The element may be secured to a second element with the axial faces 13, 22 of the elements confronting one another, the inner bores aligned and the passages in communication with each other to form a pipe coupling. In the coupling a first sealing member 25 is included between the axial faces and radially inwardly of the passages and a second sealing member 26 is provided between those faces and radially outwardly of the passages.

FIG.1



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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FIG.1

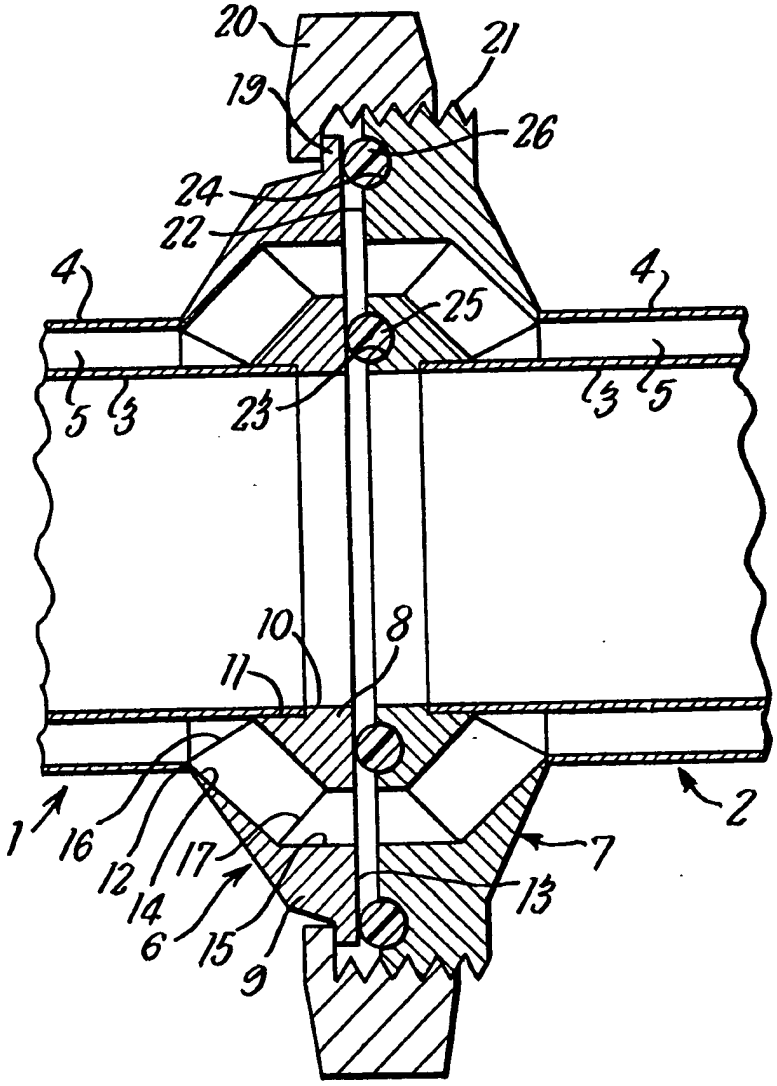

FIG.2

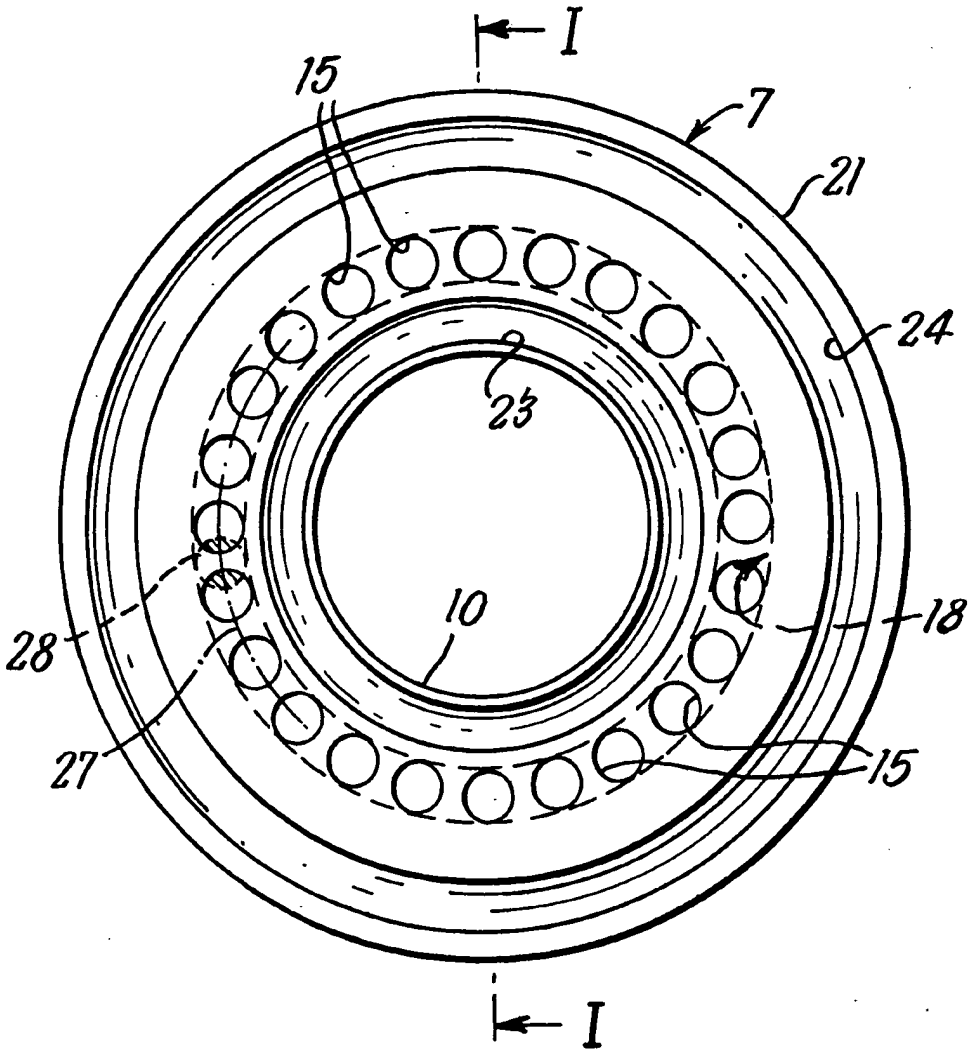

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FIG. 3

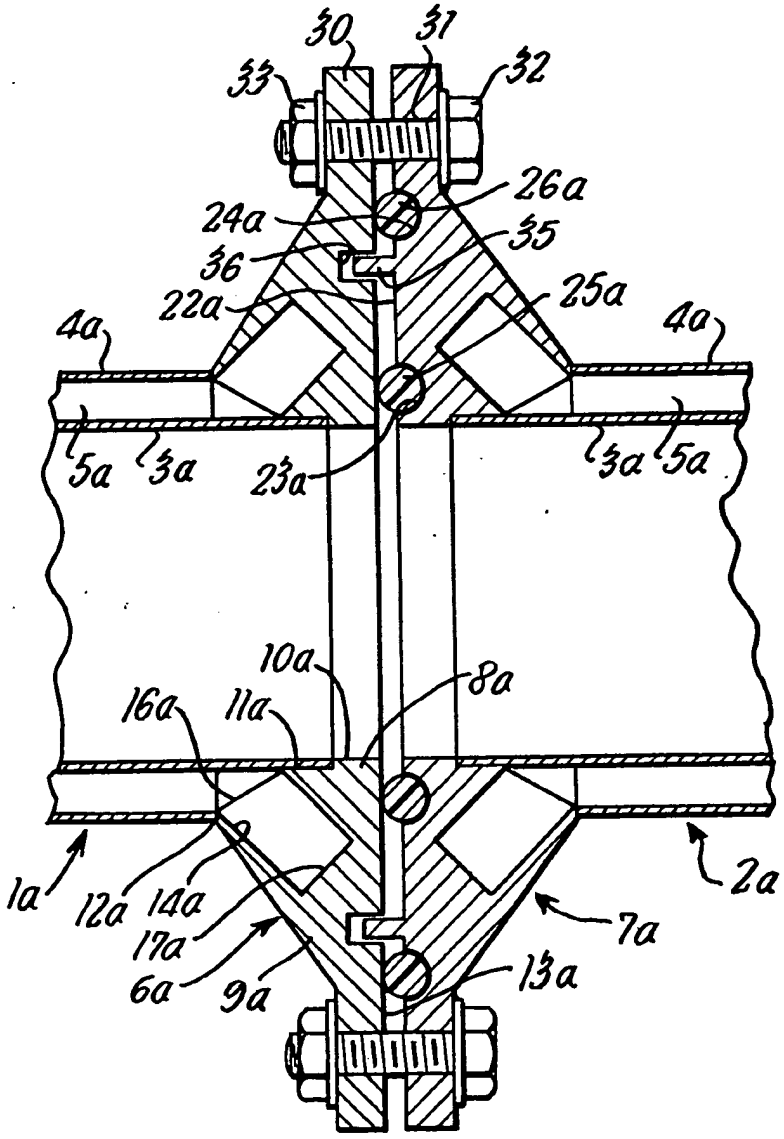

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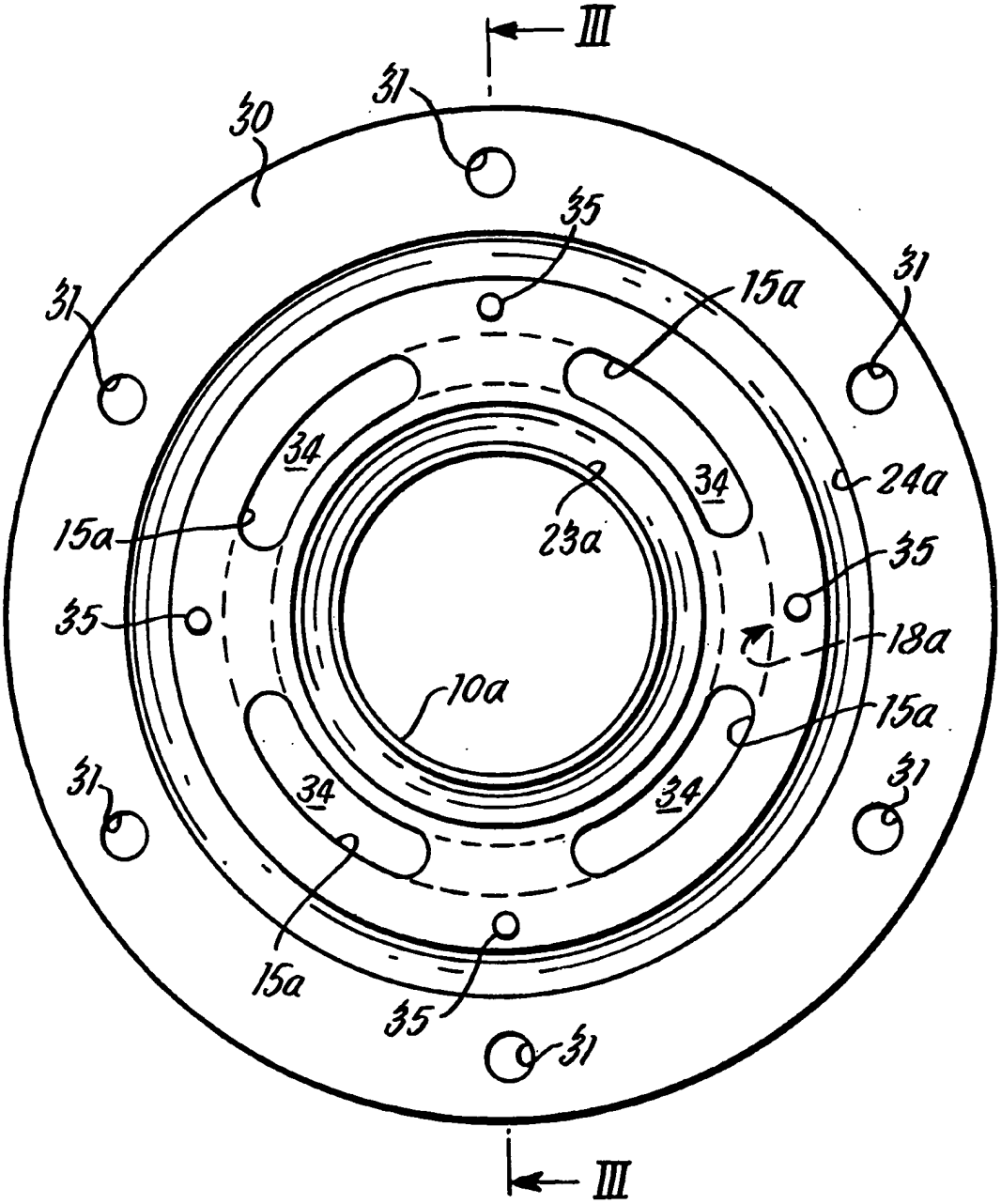
FIG.4



SPECIFICATION

A coupling element and pipe coupling for use with jacketed pipes

This invention relates to coupling elements and to a coupling for use with jacketed pipes. The term jacketed pipes as used in this specification and claims is intended to mean a pipe of the sort having an inner element defining the main flow passage and a co-axial outer element surrounding the inner element and supported and spaced therefrom so that an annular auxiliary flow passage is present around the main flow passage. Jacketed pipes are commonly used where material intended for conveyance through the main flow passage has to be maintained at a temperature other than ambient temperature and heating or cooling liquid is passed through the auxiliary flow passage.

The coupling together of two lengths of jacketed pipe has in the past been effected by cutting the jacket or outer element back to terminate short of the end of the inner element and blanking off the end of the auxiliary flow passage. The inner elements of the two lengths of pipe are then joined by any form of conventional pipe coupling. The auxiliary flow passages are joined by a bypass tube connected to radially extending inlet and outlets connected to the jacket or outer elements of the two pipe lengths to open into the auxiliary flow passage. It will be appreciated that this is a cumbersome and time consuming operation, that the flow of fluid through the auxiliary flow passage is interrupted and restricted and that the material carried in the main flow passage is without the thermal protection of the liquid in the auxiliary flow passage in the region of the coupling. The invention seeks to provide a coupling which will overcome these disadvantages.

According to the invention a coupling element for use with jacketed pipes comprising a radially inner part defining an inner bore and having a first annular section for securing to the inner pipe, a radially outer part having a second annular section for securing to the outer pipe, the second annular section being of larger diameter than the first annular section and passage means extending between the inner and outer parts and opening at one end between the first and second annular sections and at the other end into an axial face of the element, and means on the radially outer part for use in securing the element to a second element with the axial faces of the elements confronting one another.

From another aspect the invention resides in a coupling for jacketed pipes, the coupling comprising two coupling elements as aforesaid placed in axial alignment with their axial faces confronting one another and with the openings of the passage means into those faces at least partially in alignment, a first sealing member between the axial faces and radially inwardly of the openings of the passage means, a second sealing member between the axial faces and radially outwardly of the openings of the passage means, and means for securing the two elements together with the sealing members in compression.

Using a coupling according to the invention the need for a bypass arrangement for the fluid through the auxiliary flow passage is eliminated and that fluid flows through the coupling itself, as does the material through the main flow passage. The thermal protection is thus retained throughout the coupling.

Preferably the cross-sectional area of those parts of the openings of the passage means which are in alighment is substantially equal to the cross-sectional area of the outer passage of the pipe with which the coupling is designed to be used. In this way there is no restriction on the flow of the fluid in the auxiliary flow passage when this fluid passes through the coupling.

In order that the invention may be better understood, specific embodiments thereof will now be described, by way of example only, with reference to the accompanying drawings in which:—

Figure 1 is a longitudinal cross-section through a first form of coupling;

Figure 2 is an end elevation of one of the coupling elements shown in Figure 1;

Figure 3 is a longitudinal cross-section through a second form of coupling; and

Figure 4 is an end elevation of one element of the coupling shown in Figure 3.

Referring now to Figure 1 this shows a coupling for two lengths of jacketed pipe and 1 and 2. Each length of pipe has an inner element 3 defining a main flow passage and an outer element 4 co-axial with and surrounding the inner element and supported therefrom by means not shown in the drawings. An annular auxiliary flow passage 5 is formed between the inner and outer elements 3 and 4. The two pipe sections are joined by a coupling comprising first and second coupling elements 6 and 7. In order that each element may be secured to its respective pipe length the jacket or outer element 4 of the pipe length is cut back to terminate short of the inner element 3.

In many respects the two coupling elements 6 and 7 are identical and the following description, given with reference to the element 6, applies equally well to the element 7. The coupling element 6 is an integral body comprising a radially inner part 8 and a radially outer part 9. The radially inner part defines an inner bore 10 and has an annular section 11 of larger diameter for receiving the inner element 3 of the jacketed pipe section. The inner element 3 may be secured to the radially inner part 10 by brazing, soldering or welding as appropriate to the materials of the pipe and the coupling. The radially outer part has an annular section 12 for securing to the outer element 4 of the pipe, again by brazing, soldering or welding as appropriate. The annular section 12 has a larger diameter than the annular section 11 and the axial distance from the annular section 12 to an axial face 13 of the coupling element is greater than the

axial distance from the annular section 11 to the axial face 13.

Formed between the radially inner and outer parts is passage means comprising a first region 14 and a second region 15. The first region is of frusto-conical form and tapers outwardly from its opening 16 between the annular sections 11 and 12 to terminate in an annular opening 17 between the inner and outer parts 8 and 9. The second region of the passage is in the form of a plurality of axially extending holes leading from the annular opening 17 to open into the axial face 13 of the coupling element. The holes all lie within an annular zone shown as 18 in Figure 2 of the element, the zone extending axially from the annular opening 17 to the axial face 13, and the holes are spaced equally around the annular zone. The total area of all the holes is desirably between one half and two thirds of the total area of the annular zone 18. It will be understood that the material of the coupling element surrounding the holes joins the radially inner and radially outer parts 8 and 9 so unifying the element as an integral body.

The coupling element 6 now differs from the coupling element 7 in that the element 6 is formed with a radially extending flange 19 which retains on the element 6 an internally threaded connecting nut 20. The coupling element 7 has an externally threaded portion 21 on which the nut 20 engages in order to secure the two elements together. The axial face 22 of the element 7 is formed with two annular grooves 23 and 24, each of which retains a sealing ring 25 and 26 respectively, the ring 25 being located radially inwardly of the opening of the second region 15 of the passage into the axial face, and the sealing ring 26 being located radially outwardly of that opening. As the nut 20 is tightened to draw the two halves of the coupling together, the sealing rings 25 and 26 are compressed to ensure fluid-tight connections between the main flow passages of the two pipe sections and between the auxiliary flow passages of the two pipe sections.

It is desirable that the cross-sectional area of those parts of the openings of the passage means in the two coupling elements which are in alignment at the axial faces 13 and 22 of those elements have a cross-sectional area which is substantially equal to the cross-sectional area of the auxiliary flow passage 5 of the pipe. In this way the flow of fluid through the auxiliary passage is not restricted due to the presence of the coupling. In the particular example shown in Figures 1 and 2 the coupling is designed for use with a jacketed pipe wherein the outer diameter of the inner element 3 is a nominal two inches and the outer diameter of the outer element 4 is a nominal two and a half inches. The holes forming the second region 15 of the passage means are each of eight millimetre diameter and twenty-four such holes are equally spaced around the annular zone 18, the centres of the holes being located on a pitch circle 27 of 78.5 mm diameter. The total area of the holes is thus 0.61 of the total area of the annular zone 18. With this arrangement of holes in each coupling element the required fluid transmission area will be obtained despite the angular relationship of the two elements and no angular alignment of those elements is necessary. If one assumes the worst case wherein the holes in the element 7 are exactly out of phase with the holes in element 6 then each hole in element 6, for example the hole 28 shown in broken lines in Figure 2 will overlap two adjacent holes in the element 7 and the parts of the openings that are in alignment is indicated by the cross-hatched parts in Figure 2. These parts will repeat around the circumference of the annular zone 18 and it can be shown that the total area of those parts is substantially equal to the cross-sectional area of the auxiliary flow passage 5.

Referring now to Figure 3 this shows a coupling which is in many respects similar to that shown in Figure 1 and parts of the Figure 3 embodiment which are identical to those of the Figure 1 embodiment are shown by the same reference numerals shown in Figure 1 with the addition of the suffix *a*. The coupling shown in Figure 3 differs from that shown in Figure 1 in two major respects. The first is the method of securing the two coupling elements together, and in this embodiment each element is formed with a flange 30 having a number of bolt holes 31 formed therethrough. The flanges of the two elements are secured together by bolts 32 passed through aligned holes in the flanges and secured by nuts 33.

The second point of difference is that the second region of the passage means is formed by four arcuate slots 34, rather than by the holes of the Figure 1 embodiment. All the slots 34 lie in an annular zone 18*a* and again their total area is preferably between one-half and two-thirds the total area of the zone 18*a*. In order to ensure that the slots in the two elements of the coupling are axially aligned the element 7*a* is formed with four locating pins 35, and the element 6*a* is formed with four corresponding locating holes 36. In order for the coupling elements properly to engage the pins 35 must be fitted into the holes 36 and this will automatically ensure alignment of the slots 34 of the two couplings. Depending on the number and location of the bolt holes in the flanges 30 and 31 it may be possible to omit the locating pins and holes 35 and 36 in certain embodiments of the coupling.

It will be appreciated that the coupling shown in Figure 1 may be provided with a flange type connection as shown in Figure 3, and similarly the coupling shown in Figure 3 may be provided with a union nut type connection as shown in Figure 1. Other modifications to both forms of coupling are possible, and in particular the shape and disposition of the holes or slots forming the first and second regions of the passage means may be varied to suit the particular application. The part of the coupling element that receives the pipe may also be modified and this could be shaped so that

the annular sections to which the inner and outer pipe elements are secured are axially aligned so that a clean cut can be made at the end of the pipe, rather than having to cut the outer element back further than the inner element. Alternatively a coupling could be designed to accommodate a pipe with the inner element cut back further than the outer element. The sealing arrangement within the coupling may be modified and sealing members other than sealing rings may be used. The sealing members may be loosely located in receiving channels in one of the coupling elements, or may be held in those channels by adhesive or other means. The presence of locating channels is not strictly necessary, although they do assist in properly positioning the sealing means one radially inwardly and one radially outwardly of the passage means.

CLAIMS

1. A coupling element for use with jacketed pipes, the element being an integral body comprising a radially inner part defining an inner bore and having a first annular section for securing to the inner pipe, a radially outer part having a second annular section for securing to the outer pipe, the second annular section being of larger diameter than the first annular section and passage means extending between the inner and outer parts and opening at one end between the first and second annular sections and at the other end into an axial face of the element, and means on the radially outer part for use in securing the element to a second element with the axial faces of the elements confronting one another.

2. A coupling element according to claim 1 in which the axial face of the element is formed with first means for retaining a first sealing member radially inwardly of the opening of the passage means into the axial face, and with second means for retaining a second sealing member radially outwardly of the opening of the passage means into the axial face.

3. A coupling element according to claim 1 or claim 2 in which the axial distance from the axial face to the second annular section is greater than the axial distance from the axial face to the first annular section.

4. A coupling element according to claim 3 in which the passage means includes a first region of frustoconical form tapering outwardly from between the first and second annular sections and terminating in an annular opening between the inner and outer parts, and a second region extending axially from the annular opening to open into the axial face.

5. A coupling element according to claim 4 in which the second region lies within an annular zone of the element extending axially from the annular opening to the axial face.

6. A coupling element according to claim 5 in which the total area of the second region is between one-half and two-thirds of the total area of the annular zone.

7. A coupling element according to claim 5 or claim 6 in which the second region comprises a plurality of axially extending holes spaced around the annular zone and leading from the annular opening to the axial face.

8. A coupling element for use with jacketed pipes, substantially as herein described with reference to any one of the accompanying drawings.

9. A coupling for jacketed pipes, the coupling comprising two coupling elements according to any one of the preceding claims placed in axial alignment with their axial faces confronting one another and with the openings of the passage means into those faces at least partially in alignment, a first sealing member between the axial faces and radially inwardly of the openings of the passage means, a second sealing member between the axial faces and radially outwardly of the openings of the passage means, and means for securing the two elements together with the sealing members in compression.

10. A coupling according to claim 9 in which the cross-sectional area of those parts of the openings of the passage means which are in alignment is substantially equal to the cross-sectional area of the outer passage of the pipe with which the coupling is designed to be used.

11. A coupling according to claim 10 in which the openings of the passage means into the axial face of each element are arranged so that, whatever may be the angular relationship of the two elements, the cross-sectional area of those parts of the openings of the passage means which are in alignment is substantially equal to the cross-sectional area of the outer passage of the pipe with which the coupling is designed to be used.

12. A coupling for jacketed pipes, substantially as herein described with reference to any one of the accompanying drawings.

New claims or amendments to claims filed on 14th March 1979.

Superseded claim 1 and 3.

New or amended claims:—

Appendant claims re-numbered, as necessary, and appendancies corrected.

1. A coupling element for use with jacketed pipes, the element being an integral body having an axial face and comprising a radially inner part defining an inner bore and having a first annular section for securing to the inner pipe, a radially outer part having a second annular section for securing to the outer pipe, the second annular section being of larger diameter than the first annular section and lying at a greater axial distance from the axial face than does the first annular section, and passage means extending between the inner and outer parts, opening at one end into the axial face and extending radially inwardly to open at the other end between the first and second annular

sections, and means on the radially outer part for use in securing the element to a second element with the axial faces of the element confronting one another.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1980. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.